Biological Observations of the Foreign Hake Fishery for 1983

D. Davenport

Department of Fisheries and Oceans
Fisheries Research Branch
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

March 1985

Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 1811

85-5089/

Canadian Manuscript Report of Fisheries and Aquatic Sciences

These reports contain scientific and technical information that represents an important contribution to existing knowledge but which for some reason may not be appropriate for primary scientific (i.e. *Journal*) publication. They differ from Technical Reports in terms of subject scope and potential audience: Manuscript Reports deal primarily with national or regional problems and distribution is generally restricted to institutions or individuals located in particular regions of Canada. No restriction is placed on subject matter and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Manuscript Reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report will be abstracted by *Aquatic Sciences and Fisheries Abstracts* and will be indexed annually in the Department's index to scientific and technical publications.

Numbers 1-900 in this series were issued as Manuscript Reports (Biological Series) of the Biological Board of Canada, and subsequent to 1937 when the name of the Board was changed by Act of Parliament, as Manuscript Reports (Biological Series) of the Fisheries Research Board of Canada. Numbers 901-1425 were issued as Manuscript Reports of the Fisheries Research Board of Canada. Numbers 1426-1550 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Manuscript Reports. The current series name was changed with report number 1551.

Details on the availability of Manuscript Reports in hard copy may be obtained from the issuing establishment indicated on the front cover.

Rapport manuscrit canadien des sciences halieutiques et aquatiques

Ces rapports contiennent des renseignements scientifiques et techniques qui constituent une contribution importante aux connaissances actuelles mais qui, pour une raison ou pour une autre, ne semblent pas appropriés pour la publication dans un journal scientifique. Ils se distinguent des Rapports techniques par la portée du sujet et le lecteur visé; en effet, ils s'attachent principalement à des problèmes d'ordre national ou régional et la distribution en est généralement limitée aux organismes et aux personnes de régions particulières du Canada. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du Ministère des Pêches et des Océans, notamment gestion des pêches; techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les Manuscrits peuvent être considérés comme des publications complètes. Le titre exact paraît au haut du résumé de chaque rapport, qui sera publié dans la revue *Aquatic Sciences and Fisheries Abstracts* et qui figuera dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros de 1 à 900 de cette série ont été publiés à titre de manuscrits (Série biologique) de l'Office de biologie du Canada, et après le changement de la désignation de cet organisme par décret du Parlement, en 1937, ont été classés en tant que manuscrits (Série biologique) de l'Office des recherches sur les pêcheries du Canada. Les numéros allant de 901 à 1425 ont été publiés à titre de manuscrits de l'Office des recherches sur les pêcheries du Canada. Les numéros 1426 à 1550 ont été publiés à titre de Rapport manuscrits du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été changé à partir du rapport numéro 1551.

La page couverture porte le nom de l'établissement auteur où l'on peut se procurer les rapports sous couverture cartonnée.

Canadian Manuscript Report of
Fisheries and Aquatic Sciences No. 1811

March 1985

BIOLOGICAL OBSERVATIONS OF THE FOREIGN HAKE FISHERY FOR 1983

by

D. Davenport

Department of Fisheries and Oceans
Fisheries Research Branch
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

(c) Minister of Supply and Services Canada 1985

Cat. No. Fs 97-4/1811E ISSN 0706-6473

Correct citation for this publication:

Davenport, D. 1985. Biological observations of the foreign hake fishery for 1983. Can. MS Rep. Fish. Aquat. Sci. No. 1811: 15 p.

ABSTRACT

Davenport, D. 1985. Biological observations of the foreign hake fishery for 1983. Can. MS Rep. Fish. Aquat. Sci. No. 1811: 15 p.

Non-North American fisheries off Canada's Pacific coast during 1983 were limited to a trawl fishery for Pacific hake (Merluccius productus) by Poland; and a cooperative trawl fishery for hake by Poland and the U.S.S.R. Quotas were 12,500 t national and 12,500 t cooperative for Poland, and 17,000 cooperative for the U.S.S.R. Observer effort centered on total catch and species content estimation.

In the combined fisheries, observer figures show hake accounting for 98.2% of the total catch of 40.9 thousand tonnes, of this, 12.6 thousand tonnes or 31% was monitored. Of secondary importance were rockfish (Sebastes sp.) 590 t, walleye pollock (Theragra chalcogramma) 31 t, spiny dogfish (Squalus acanthias) 173 t and Pacific salmon (Oncorhynchus sp.) 8358 pieces.

Key words: foreign fisheries, biological observers, Pacific coast, catch monitoring

RESUME

Davenport, D. 1985. Biological observations of the foreign hake fishery for 1983. Can. MS Rep. Fish. Aquat. Sci. No. 1811: 15 p.

En 1983, la pêche étrangère dans les eaux hauturières canadiennes du Pacifique s'est limitée au chalutage de merlu du Pacifique (Merluccius productus) par la Pologne et à un effort coopératif de pêche du merlu par la Pologne et l'U.R.S.S. Dans le premier cas, le contigent totalisait 12,500 t et dans le second, 12,500 t pour la Pologne et 17,000 pour l'U.R.S.S. Les observateurs ont centré leur évaluation sur les prises totales et la variété des espèces.

Dans les pêches combinées, les relevés d'observateurs indiquent que le merlu composait 98.2% des prises totales de 40.9 milliers de tonnes; de ce total, 12.6 ou 31% étainet contrôlés. Venaient ensuite par ordre d'importance le sébastre (Sebastes sp.): 590 t, la morue du Pacifique occidental (Theragra chalcogramma): 31 t, l'aiguillat (Squalus acanthias): 173 t et les saumons du Pacifique (Oncorhynchus sp.): 8,358 poissons.

Mots-clés: Pêches étrangères, observateurs biologistes, côte du Pacifique, surveillance des prises

INTRODUCTION

The 1983 Pacific hake (Merluccius productus) offshore fishery in Canadian waters occurred from June 19 to November 21. Foreign factory trawl vessels from Poland were involved in both national and joint-venture fisheries, and the U.S.S.R. in the joint-venture fishery only. Observer coverage of these fisheries began August 22, 1983. Observers selected by the Offshore Commercial Fisheries Division of D.F.O. in Vancouver worked with two technicians from the Groundfish Program of the Pacific Biological Station (P.B.S.) in Nanaimo.

This report documents observer coverage of the 1983 fishery, describes the methodology for estimating the total catch aboard foreign vessels, compares catch records submitted by the foreign vessels to those of the observers, and provides recommendations for improving future observer coverage.

METHODS AND MATERIALS

The observers were hired by the Offshore Division. Prior to boarding the foreign vessels they received information regarding licencing, rules and regulations and radio procedure. A P.B.S. technician gave them brief instructions on how to estimate a total catch and provide information and description on species composition of the catch and incidence of prohibited species (salmon, Oncorhynchus spp.; Pacific halibut, Hippoglossus stenolepis, and Pacific herring, Clupea harengus pallasi) occurring in the catch. With this information they were transferred aboard the foreign vessels by the Fisheries Patrol Craft TANU on August 22.

An observer does his work with the captain's approval and in safety as long as he stays out of the way of moving gear and does not hamper the deck crew in their work. Willingness to do the job, combined with common sense and appropriate timing will keep the observer out of difficulties and enable him to produce accurate data once the necessary training and/or experience has been acquired.

FISHING

The offshore fishery is divided into two parts. First, the joint-venture or cooperative fishery involves a number of Canadian trawlers acting as "catcher boats" which transfer the cod-end of fish to the factory vessel for processing. Cod-ends capable of retaining up to 40 t of fish are provided to each of the catcher boats. Secondly, the national or independent fishery permits the foreign vessels to fish for themselves outside the

joint-venture fishing area. The national fishery also included catches made by foreign vessels involved in the joint venture fishery. This was termed supplemental fishing which meant foreign vessels fished when the Canadian vessels could not supply sufficient quantities of Pacific hake.

The midwater tows vary in duration according to the concentration of fish seen entering the net via the echo sounder from the transducer attached to the headrope of the net.

ESTIMATING CATCH

Two methods were employed by the observer to accurately estimate the total weight of each trawl catch. The first method was for the observer to be positioned at the stern of the vessel, looking down into the stern ramp as the net was winched aboard. From this position the tightly packed codend could be observed and an estimate made of its length and diameter. The length was determined by counting the number of restraining ropes surrounding the filled portion of the codend and multiplying this figure by the distance between the ropes. The diameter was determined by comparing the height along the filled portion of the codend to a known height on the side of the ramp. The codend is approximately circular in cross section when packed tightly with fish and remains this shape while being hauled up the ramp. The length and diameter estimates are valid volume parameters and volume-weight tests have shown that 1 cu-ft of live/fresh hake compressed as in a codend weighs on the average 25.1 kg (55.3 lbs) (Davenport pers. comm.). A volume-weight conversion table to facilitate the observer in estimating the total weight of a catch is in Table 1.

The second estimation of the total weight of a trawl catch was made when the content of the codend was emptied into holding tanks or bins of known capacities. The observer calculates the volume of the bins on his vessel and applies the same volume-weight conversion factor to estimate the total catch. In some cases the holding bins are not empty prior to emptying the codend from a new trawl catch and the observer must estimate the remaining volume in the bin and calculate the weight accordingly.

Both total catch estimates are compared and differences are resolved depending on the confidence of estimating the catch by either method. The final estimate for the trawl catch is recorded by the observer and compared to that of the foreign vessel "ship estimate". The observer's figures are final and remain unaltered even when compared with the factory production figures.

RESULTS

The foreign fleet activities were regulated by the management areas 5-1A, 5-1B and 5-2 (Fig. 1). The U.S.S.R. fleet participating in the joint-

venture fishery only, received the majority of their catch from 5-1A while the Polish fleet catches, joint-venture and national, were distributed between the three areas. A total of nine foreign vessels participated in the fishery; five from Poland and four from the U.S.S.R. The joint-venture fishery involved eighteen Canadian trawlers, the number fishing for each nation and individual factory vessel varied slightly according to supply and demand.

A total of ten observers were aboard the foreign vessels at various times during the fishery. The observer coverage activities were presented in terms of days fished, codends received and examined and as a comparison with the ships figures for total catch by species based on factory production. Percent observer coverage (observer days/vessel days x 100) of the total vessel days varied from 5.7% on the U.S.S.R. joint-venture vessels, to 100% on the Polish national vessels. Observers sampled a total of 273 vessel days (33.2%) (Table 2). The national fishery (46.2%) received more coverage in terms of days fished than the joint-venture fishery (24.4%). During the time at sea the observers examined a total of 1026 codends for a 30.9% coverage (Table 3). The national fishery (47.5%) received more coverage in terms of codends examined than the joint venture fishery (22.3%).

The total allowable catch of Pacific hake for the 1983 fishery in the Canadian zone was 42,000 t; 25,000 t Poland and 17,000 t U.S.S.R. The total taken was 40,833 t (Table 4). Estimating the total catch was the main task of the observers and to the inexperienced it is a difficult undertaking. The observer coverage of the Pacific hake catch processed nationally was 48.2% and 22.4% by joint venture, similar to the percent coverage for days fished and codends received. The majority of the observer estimates of the Pacific hake catch were lower than the ships' figures and in one case (MUSTEL), both the observers' and ships' figures were identical (Table 5). The observers' estimates were 2.0 and 3.9% lower for the joint-venture and the national fisheries, respectively (Table 6), when compared to the ships' production figures.

Rockfish dominated the incidental catch for both nations (Table 5). A predominant portion of the rockfish catch was made up of Sebastes flavidus (56.0%) (Table 7). The presence of rockfish was constantly understated in ships national figures though they did rise considerably when an observer was aboard (Table 8). The rockfish catch was estimated 8.9% and 49.4% higher by the observers for the national and joint-venture catches, respectively (Table 9). The difference between the observers' and ships' figures is in part due to the experience of the observer and/or under-reporting by the foreign vessels.

Walleye pollock (Theragra chalcogramma) catches were small and varied considerably between the observer and ship figures (Table 5 and 6).

Spiny dogfish (Squalus acanthias) were mostly discarded by the deck crew when the cod-end was opened. They were also discarded by the graders on the primary conveyors in the factory. An estimate of the dogfish catch was ultimately made and estimates by the observer were similar to those of the ships' figures (Table 5 and 6).

Salmon, recorded in numbers rather than in weights, were also discarded by the deck crew and from the primary conveyor in the factory. Observer figures were either actual counts or were pro-rated from counts in

portions of a catch. Ship figures were mostly estimates rather than actual counts. The majority (75%) of the salmon were identified as chinook salmon (Oncorhynchus tshawytscha), ranging in body weight from 1.5-3.0 kg (Table 10). The greatest incidental catch of salmon came from the joint-venture fishery in an area close to Cape Beale (Fig. 1).

Incidental catches of other species included 7.8 t of Pacific herring (Clupea harengus pallasi) and a total of 10 Pacific halibut (Hippoglossus stenolepis). Other species noted include lingcod (Ophiodon elongatus), Pacific cod (Gadus macrocephalus), sablefish (Anaplopoma fimbria), thresher shark (Alopias vulpinus), blue shark (Prionace glauca), eulachon (Thaleichthys pacificus), smelts (Osmeridae), turbot (Reinhardtius hippoglossoides) and flatfishes (Pleuronectidae).

RECOMMENDATIONS

Personnel hired as observers must be capable of working in an isolated environment in terms of language barrier and be able to work at sea for extended periods with little or no supervision. They should have a training period that deals with all aspects of the fishing operations aboard the foreign vessels. The observers should be properly trained in catch estimates, species recognition and the proper way to complete data forms before going aboard foreign vessels. The limited observations to date indicate that the ships' production figures (officially accepted) contain inaccuracies, especially in their underestimation of the incidental rockfish catch. More extensive coverage by trained and competent observers is necessary to determine the extent of discrepancies between ships' actual and reported catch. It is obvious that the figures must be accurate and that species must be correctly identified.

Observers should not involve themselves in the supply and demand situation between the catcher and processing vessels, this would necessitate their being on the radio-phone attempting to organize the tonnage and delivery time of codends at the expense of their assigned duties. This is the job of the consortium representative if there is one, or of the captains of the two vessels if there is not.

Care should be taken by the hiring authority in the selection of observers. Perception and adaptability make the job and life on board more agreeable and produce better work results. Speaking the language of the host vessel is also of great advantage.

D.F.O. should provide letters of introduction in the languages of the factory vessels, these would outline the requirements and duties of the observer while on board.

Table 1. Conversion of the cod-end diameter (ft^2 or m^2) to weight of Pacific hake in tonnes of full cod-ends.

Diameter cod-end ft.	in.	Area of cross section sq. ft.	Lbs. per foot of full cod-end	Tonnes per foot of full cod-end	Diameter cod-end meters	Area of cross section sq. meters	Kg. per meter of full cod-end	Tonnes per meter of full cod-end
4	6	15.90	879	.40	1.37	1.48	1308	1.31
4	9	17.72	980	.45	1.45	1.65	1462	1.46
5	0	19.64	1086	.49	1.52	1.81	1603	1.60
5	3	21.65	1197	.54	1.60	2.01	1781	1.78
5	6	23.75	1313	.60	1.68	2.22	1967	1.97
5	9	25.97	1436	.65	1.75	2.41	2135	2.14
6	0	28.27	1563	.71	1.83	2.63	2330	2.33
6	3	30.68	1697	.77	1.91	2.85	2525	2.53
6	6	33.18	1835	.83	1.98	3.08	2729	2.73
6	9	35.78	1979	.90	2.06	3.32	2942	2.94
7	0	38.48	2128	.97	2.13	3.58	3172	2.17
7	3	41.28	2283	1.04	2.21	3.84	3402	3.40
7	6	44.18	2443	1.11	2.29	4.10	3633	3.63

Table 2. Observer coverage in terms of days fished by fishery and by vessel.

Nation and ship	Total days fished	National			Joint-venture		
		Days fished	Days observed	% coverage	Days fished	Days observed	% coverage
POLISH							
WALEN	129	94	35	37.2%	35	8	22.9%
POLLUX	110	60	34	56.7%	50	4	8.0%
AWIOR	112	70	25	35.7%	42	23	54.8%
GRINWAL	113	66	19	28.8%	47	38	80.9%
MUSTEL	114	41	40	100.0%	73	6	8.2%
SOVIET							
KURILSKIY	55	-	-	-	55	14	25.5%
KRONOTSKIY	60	-	-	-	60	10	20.0%
OREKHOVA	59	-	-	-	59	13	22.0%
OTRADNIY	70	-	-	-	70	4	5.7%
TOTAL	822	331	153	46.2%	491	120	24.4%

Table 3. Observer coverage in terms of cod-ends received and examined by fishery and by vessel.

Nation and ship	Total tows codends received	National			Joint-venture		
		Tows	Tows observed	% coverage	Tows	Tows observed	% coverage
POLISH							
WALEN	571	443	181	40.9%	128	28	21.9%
POLLUX	451	212	128	60.4%	239	12	5.0%
AWIOR	347	179	63	35.2%	168	70	41.7%
GRINWAL	419	238	64	26.9%	181	147	81.2%
MUSTEL	407	148	144	97.3%	259	26	10.0
SOVIET							
KURILSKIY	230	-	-	-	230	32	6.1%
KRONOTSKIY	271	-	-	-	271	48	3.7%
OREKHOVA	305	-	-	-	305	63	4.3%
OTRADNIY	316	-	-	-	316	20	1.3%
TOTAL	3317	1220	580	47.5%	1997	446	22.3%

Table 4. Observer coverage of the Pacific hake catch by fishery and by vessel. Weights in kilograms.

Nation and ship	Total hake caught-received	National[a]			Joint venture		
		Hake caught	Catch observed	% coverage	Hake received	Catch observed	% coverage
POLISH							
WALEN	5,512,949	3,856,208	1,649,763	42.8	1,656,741	363,402	21.9
POLLUX	5,963,224	3,026,248	1,866,189	61.7	2,936,976	200,185	6.8
AWIOR	4,655,938	2,167,361	744,238	34.3	2,488,577	1,155,557	46.4
GRINWAL	4,689,303	2,412,478	468,794	19.4	2,276,854	1,821,268	80.0
MUSTEL	5,819,600	1,714,746	1,624,814	94.8	4,104,854	310,749	7.6
SOVIET							
KURILSKIY	3,007,181	-	-	-	3,007,181	478,916	15.9
KRONOTSKIY	3,268,308	-	-	-	3,268,308	699,923	21.4
OREKHOVA	3,967,159	-	-	-	3,967,159	893,263	22.5
OTRADNIY	3,948,915	-	-	-	3,948,915	282,184	7.1
TOTAL	40,832,577	13,177,041	6,353,798	48.2%	27,655,536	6,205,447	22.4%

[a]National catch includes supplemental.
National catch 12,555,812 kg.
Supplemental catch 621,229 kg.

Table 5. Comparison of ships' figures and observers' estimates during observed period, for the total catch of Pacific hake and incidental catches of rockfish, walleye pollock, spiny dogfish, and salmon by fishery and by vessel. Weights in kilograms.

Nation and ship	Days obs.	No. of tows	Hake		Rockfish		Pollock		Dogfish		Salmon (nos.)	
			ship	obs	ship	obs	ship	obs	ship	obs	ship	obs
NATIONAL												
POLISH												
WALEN	35	181	1,649,763	1,634,546	48,821	51,537	0	49	14,500	12,605	34	46
POLLUX	34	128	1,866,189	1,777,380	48,735	71,208	5,999	720	9,700	7,857	90	42
AWIOR	25	63	744,238	730,695	27,698	30,745	2,555	665	1,380	5,950	23	7
GRINWAL	19	64	468,794	490,695	33,435	24,360	0	0	1,410	2,330	10	9
MUSTEL	40	144	1,475,373	1,475,373	67,710	70,777	0	40	8,500	8,796	78	71
TOTAL	153	580	6,353,798	6,108,689	226,399	248,627	8,554	1,474	35,490	37,538	235	175
JOINT-VENTURE												
POLISH												
WALEN	8	28	363,402	375,527	219	934	0	148	1,200	1,424	648	629
POLLUX	4	12	200,185	190,687	548	2,410	0	580	0	560	8	6
AWIOR	23	70	1,155,557	1,086,935	250	2,258	0	2,050	6,740	5,255	168	106
GRINWAL	38	147	1,821,268	1,715,770	1,815	5,439	903	1,165	7,560	7,445	416	81
MUSTEL	6	26	310,749	284,934	2,000	3,070	0	0	3,070	4,063	15	8
SOVIET												
KURILSKIY	14	48	478,916	481,930	0	10	0	190	880	990	477	671
KRONOTSKIY	10	32	699,923	707,860	2,445	2,190	0	0	30	155	0	4
OREKHOVA	13	63	893,263	956,975	2,135	2,737	0	2,135	0	1,875	244	295
OTRADNIY	4	20	282,184	278,000	0	0	0	0	0	0	0	0
TOTAL	120		6,205,447	6,078,618	9,412	19,048	903	6,268	19,480	21,767	1,976	1,800

Table 6. Comparison of ship total catch estimates for all species and observers projected total catch of all species by fishery. Weights in kilogram (salmon in numbers, not included in weights).

	Pacific hake		Rockfish		Walleye pollock		Spiny dogfish		Salmon (nos.)		Total weight all species Excluding salmon		Type of Fishery
	Ship	Obs.	Ship	Obs.	Ship	Obs.	Ship	Obs.	Ship	Obs.	Ship	Obs.	
Weights	13,077,041	12,416,234	320,687	505,570	12,946	2,997	165,835	76,332	563	366	13,676,509	13,001,133	
% of total	96.3%	95.5%	2.4%	3.9%	0.9%	0.0%	1.2%	0.6%			100.8%	100.0%	National[a]
obs. + or -	-760,807	3.9% low	+184,883	36.6% hi	-9,949	76.8% lo	-89,503	54.0% lo			-627,376	3.1% low	
Weights	27,656,536	27,033,771	50,121	84,675	6,403	27,864	89,945	96,762	4,004	8,002	27,803,005	27,243,072	
% of total	99.5%	99.2%	0.2%	0.3%	0.0%	0.1%	0.3%	0.4%			100.0%	100.0%	Joint venture
obs. + or -	-621,765	2.0% low	+34,554	40.8% hi	+21,461	77.0% hi	+6,817	7.0% hi			-658,933	1.8% low	
Weights	40,832,577	39,460,005	370,808	590,245	19,349	30,861	255,780	173,094	4,567	8,368	41,478,514	40,244,205	
% of total	98.4%	98.2%	0.9%	1.5%	0.0%	0.1%	0.6%	0.4%			99.9%	100.2%	Combined
obs. + or -	-1,382,572	2.6% low	+219,437	37.2% hi	+11,512	37.3% hi	-82,686	32.3% lo	+3,791	45.4% hi	1,234,309	2.2% low	

[a]National catch includes supplemental catch.

Table 7. Common and scientific names of rockfish species within the catch with a comparison of the ships' and observers' projected catch estimates.

Rockfish species			Species weight	Species weight
Scientific name	Common name	Percent	ships total figures	obs.[a] projected figures
S. flavidus	Greenies	56%	207,652	330,537
S. proriger	Red stripe	26%	96,410	153,463
S. entomelas	Brownies	8%	29,665	47,220
S. alutus	Perch	6%	22,248	35,415
S. pinniger	Canaries	2%	7,416	11,805
S. brevispinis	Silvergrays	1%	3,708	5,902
S. paucispinis	Rock salmon	1%	3,708	5,902
S. babcocki	Convicts	<1%	trace	trace
S. zacentrus	Long jaws	<1%	trace	trace
S. crameri	Dark Blotched	<1%	trace	trace
S. reedi	Yellowmouth	<1%	trace	trace
		100%	370,80	590,245

[a]obs.=observer

Table 8. Relative percent of rockfish in both observed and unobserved catches from ships' production log books by fishery and by vessel. Weights in kilogram.

National

Ship	Hake caught when obs. aboard	Rockfish in catch	% rockfish present	Hake caught when obs. not aboard	Rockfish in catch	% rockfish present
WALEN	1,649,763	48,821	3.0%	2,271,202	24,693	1.1%
POLLUX	1,866,189	48,735	2.6%	1,135,605	9,584	0.8%
AWIOR	744,238	27,698	3.7%	1,125,941	25,952	2.3%
GRINWAL	468,794	33,435	7.1%	1,943,647	34,059	1.8%
MUSTEL	1,624,814	67,710	4.2%	89,926	0	0.0%
Total	6,353,798	226,399	3.6%	6,566,321	94,288	1.4%

Joint-venture

Ship	Hake caught when obs. aboard	Rockfish in catch	% rockfish present	Hake caught when obs. not aboard	Rockfish in catch	% rockfish present
WALEN	363,402	219	0.1%	1,293,339	329	0.0%
POLLUX	200,185	548	0.3%	2,642,961	2,989	0.1%
AWIOR	1,155,557	250	0.0%	1,336,841	0	0.0%
GRINWAL	1,821,268	1,815	0.1%	475,511	10,731	2.3%
MUSTEL	981,228	2,000	0.2%	3,123,626	5,750	0.2%
KURILSKIY	478,916	0	0.0%	2,528,265	0	0.0%
KRONOTSKIY	699,923	2,445	0.3%	2,568,385	6,109	0.2%
OREKHOVA	893,263	2,135	0.2%	3,073,896	11,290	0.4%
OTRADNYY	282,184	0	0.2%	3,666,731	3,511	0.1%
Total	6,875,926	9,412	0.1%	20,709,555	40,709	0.2%

Table 9. Comparison of ships' and observers' estimates of rockfish catches by fishery and by vessel.

Nation and ship	Days observed	No. of tows	National				Joint venture					
			Ship	Obs.[a]	% difference Obs. high	% difference Obs. low	Days obs.	No. of tows	Ship	Obs.	% difference Obs. high	% difference Obs. low
POLISH												
WALEN	35	181	48,821	51,537	5.3%		8	28	219	934	76.6%	
POLLUX	34	128	48,735	71,208	31.6%		4	12	548	2,410	77.3%	
AWIOR	25	63	27,698	30,745	9.9%		23	70	250	2,258	88.9%	
GRINWAL	19	64	33,435	24,360		27.1%	38	147	1,815	5,439	66.6%	
MUSTEL	40	144	67,710	70,777	4.3%		6	26	2,000	3,070	34.9%	
SOVIET												
KURILSKIY	-	-	-	-	-	-	14	48	0	10	100.0%	
KRONOTSKIY	-	-	-	-	-	-	10	32	2,445	2,190		10.4%
OREKHOVA	-	-	-	-	-	-	13	63	2,135	2,727	22.0%	
OTRADNYY	-	-	-	-	-	-	4	20	0	0	0.0%	
							41	163	4,580	4,937	7.2%	
Total	153	580	226,399	248,627	8.9%		120	446	9,412	19,048	49.4%	

[a]Obs.=observer

Table 10. Incidental catch (projected numbers) of salmon species by fishery.

Fishery	Chinook		Coho		Chum		Sockeye & Pink		Total
	Nos.	Est. avg. wt. range	Nos.	Est. avg. wt. range	Nos.	Est. avg. wt. range	Nos.	Est. avg. wt. range	
National	267	1.5 to 3.0 kg	44	3.0 to 5.0 kg	45	3.0 to 5.0 kg	Trace	-	356
Cooperative	6002	1.5 to 3.0 kg	1000	3.0 to 5.0 kg	1000	3.0 to 5.0 kg	Trace	-	8002
Total	6269		1044		1045		Trace		8358

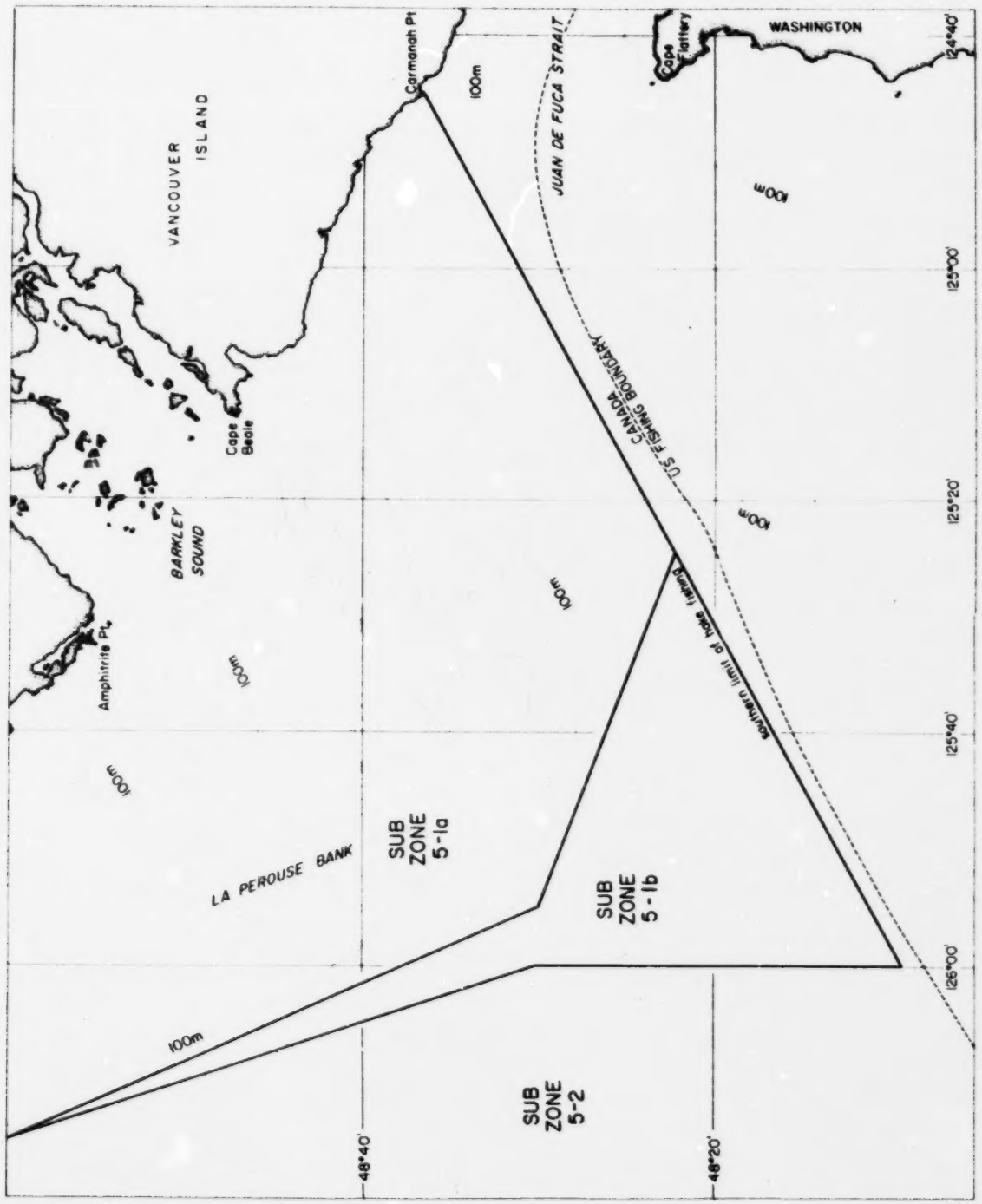

Figure 1. Management areas for the offshore Pacific hake fishery off of southwest Vancouver Island.